APPENDIX 3

The Fur Journal

VOLUME XVI SEPTEMBER-OCTOBER • 1950 NUMBER 7

Mink Production in Relation to Stilbestrol

By Robert K. Enders, Agent, and William Lloyd Merrills, Agent, Bureau of Animal Industry and Swarthmore College cooperating.

The use of poultry waste in the feeding of mink has become widespread. Various sources estimate that between 40,000 and 50,000 of these animals have received this feed during the past year. Where the product contained some active estrogen its use appears to have resulted in breeding failures, some complete, some partial. Circumstantial evidence indicates that the substance involved is diethylstilbestrol. This synthetic estogenic hormone was released for use in fattening poultry in the fall of 1947. It has come into wide use in the chemical "castration" of poultry and its use is being extended rapidly. It is not known whether all waste from "caponettes" which is a common name applied to treated birds, is harmful or whether only the pellets of the hormone that remain unabsorbed by the bird cause breeding failures in mink. Here again circumstantial evidence indicates that it is the residue of the unabsorbed pellet that gives the waste from treated birds its undesirable quality.

Experimental proof that diethylstilbestrol injected into or fed to female mink during the breeding season will bring about breeding but will interfere with the production of kits has been in existence for four years. Some of the evidence was published in 1947. In fact, this hormone is so potent that mink deprived of their ovaries will attempt mating, if they are given this hormone during the breeding season. But diethylstilbestrol does not act like the natural estrogens of the mink, for while it induces breeding behavior it does not bring about vulvar swelling. Diethylstilbestrol, moreover, interferes with the follicles in which the eggs are growing, so in spite of breeding few if any kits will be born.

In 1948 and '49 we tried to get results from mink breeders who asked for this hormone to use on females still unbred at the end of the season. A number used the hormone but only a few were interested enough in the experiment to send in their results. Those cooperative enough to do so reported successful matings but no live kits, so one is led to believe that the breeders who did not report were disappointed in reproduction, too. These cooperators were warned at the time the material was sent to them that its use was experimental, and that they were dealing with a very potent hormone. One must remember that these females were not treated until it was clear that they were not likely to breed and that production from late matings is poor under normal conditions. It is fair to assume, however, that part of the failure to produce kits arose from the effect of the diethylstilbestrol on the ovary.

Total Failures

The following cases are presented to illustrate the type of troubles encountered and to show how an analysis of the known facts, even when they are not supported by experimental work, can point out dangers in feeding material suspected of containing a synthetic estrogen. Since the use of synthetic estrogens in fattening poultry is expected to increase threefold this year, the fur farmer who plans to feed the poultry waste should be alert to the dangers.

When chicken waste, suspected of containing "caponettes," was fed from November to March the mink so fed produced not a single kit. When fed from November to June the same disastrous results followed as for the shorter interval. No one knows how much diethylstilbestrol these animals received, nor does anyone know how much is required over such a length of time to bring about these failures. It is suspected that chicken waste with diethylstilbestrol was the factor involved, for cats fed the same feed bred continuously but did not produce kittens until the feed had been discontinued for some months. The ovaries of kit minks fed this diet showed, on sectioning and examination under the microscope, a considerable disturbance of normal development.

When chicken waste again suspected of containing "caponette" material that had had pellets of diethylstilbestrol implanted under the skin was fed for a long time but not at a high level, total failure of reproduction followed the feeding. Here again cast living on the same feed as the mink bred furiously and continuously but did not produce kittens. This effect on cats is emphasized, for ovulation in these animals follows copulation much as in mink but unlike mink cats go out of heat following ovulation. Continuous heat without the production of kittens shows that some hormone, either the cat's own or that taken in the feed, kept these animals in heat and interfered with the physiological processes either of ovulation, fertilization or implantation but most probably ovulation. Had the cats ovulated and corpora lueta formed as under normal conditions, they would have gone out of heat for 36 days even though fertilization did not follow ovulation. We can infer that it was the failure of ovulation that was responsible in part for the continuous heat. This type of behavior of cats on ranches many miles apart but all feeding on poultry waste is indicative that in each case the chicken waste contained some ingredient that brought about this unnatural condition, for chicken waste was about the only ingredient common to the mix fed at all theese ranches.

On another ranch, waste containing heads of both chickens and turkeys was used in the feed from January until March. Subsequent check of the source of supply verified the fact that some of the waste was from poultry treated with diethylstilbestrol. On this ranch the males would not copulate and on examination in early March the testes proved to be as small as they usaully are in December. These animals were treated with iodinized casein from March 15 to April 5. Since the males were not in breeding condition, three males were brought in from unaffected ranches. Forty per cent of the females bred but of these only 4.4% bore litters. All these litters were sired by one male so it is possible that the other two males were at fault. Even if these two males had been as good as the third male, only 13.2% of the females bred would have produced litters. Because only 40% of the females were bred and because only 4.4% of these bore litters, the percentage of females kept over bearing litters was less than 1%! Once again the reader must remember that these matings took place late in the season. An important finding

(Continued on Page 10)

Mink Production

(Continued from Page 4)

on this ranch was that the testes of the male approached normal size about the first week in May. Whether this was the natural result of the withdrawal of some ingredient in the feed or of the feeding of the iodinized casein referred to before is not provable under the circumstances for feeding of the suspected poultry waste was discontinued when iodinized casein was added to the diet.

Partial Failure

Poultry waste, some of which came from "caponettes," fed during the winter and spring but not continuously resulted in erartic breeding behavior and in some implantations but in the birth of but one kit. Animals that had been brought to this farm a few weeks before the breeding season reproduced normally. The kit was examined late in June and appeared to have been born very late in the season. The writer would judge that it arrived nearer June 1 than May 1. From mink that were palpated it appeared that some of the mink had become pregnant but the kits were dead. This is an interesting observation in view of the fact that this herd seems to have had a light dose of diethylstilbestrol and that intermittently. Under such conditions fertilization apparently takes place, implantation follows, but the kits die before birth. It has not been proved that diethylstilbestrol will cause mink kits to die before birth, but this is indicated by the high percentage of females receiving chicken waste from "caponettes" that became pregnant only to resorb their young. In sizeable dosages the hormone affects the growing follicles, but at a low rate of administration the follicle is not damaged to such an extent that ovulation is impossible. Nevertheless, no kits are born because the egg, though fertilized, does not develop. The possibility that resorption was caused by a direct effect of the hormone on the embryo or placenta cannot be overlooked, but direct evidence that it affects either the embryo or the placenta is lacking.

Another deduction that can be made from the experience on this ranch is that low levels of feeding, kept low more by the fact that the hormone was fed only periodically than by dilution, does not sterilize all the male all the time. Otherwise it would be difficult to explain how so many of the females became pregnant even though they were not able to carry kits through to birth.

Effect on Breeding Stock

Disastrous as the feeding of diethylstilbestrol is to current production, the one ray of hope to the rancher who has suffered is the fact that many of his breeding animals will produce if kept over to the next breeding season. Several ranchers have kept over mink that failed to breed after feeding poultry waste suspected of containing material from "caponnetes." On one farm of 16 females that had borne litters before they were fed the hormone, 9 produced litters while 19 ftmales fed the waste when they were kits produced only 5 litters. This is in keeping with histological observations made on ovaries secured at pelting time, which indicated that the ovaries of some of the kits appeared to be injured beyond regeneration. On another farm 80 litters were produced by 121 females but these were not classified into adult and kit females. Apparently the Aleutians are affected more than are other mink, but because of the small numbers involved it is not safe to say that this is due to the same factor or factors that had caused the trouble originally.

Males as well as females may return to normal breeding condition after the feeding. Apparently the percentage of sterility is not much higher than that found among untreated males.

The feeding of poultry waste containing diethylstilbestrol has other interesting physiological results but these will not be discussed here.